PATENT ABSTRACTS OF JAPAN

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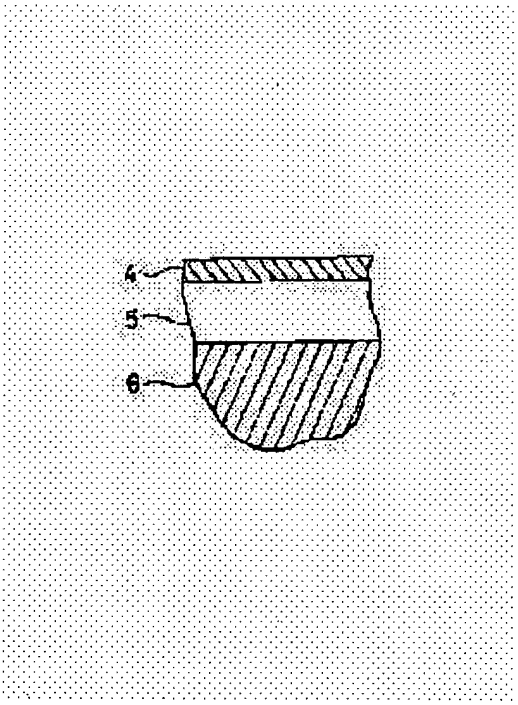
(54) SWITCHING DEVICE

(57)Abstract:

PURPOSE: To improve the corrosion resistance and wear resistance of a sliding part by coating the surfaces of sliding parts to be mutually slid with a TiN layer and an amorphous transparent hard carbon layer.

CONSTITUTION: The surfaces of sliding parts of a pair of mutually sliding members 6 are coated with a TiN layer 5. Further, the surface of the TiN layer 5 is coated with an amorphous transparent hard carbon layer 4. Thus, the coefficient of friction of the sliding part is reduced to improve wear resistance. Further, operating force is reduced, and the performance in grease-less state of the sliding part is improved. The coating is provided in the sliding part between a chain pin and a hook.



LEGAL STATUS

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to switchgears, such as a breaker or a disconnector.
[0002]
[Description of the Prior Art] The actuation device section of a switchgear is shown in drawing 4 . Namely, the lever 14 which the cutoff section 17 and pars intermedia were supported to revolve by the auxiliary shaft 16, and the actuation device section of this switchgear connected the end section with the cutoff section 17, and formed the roller 15 in the other end, The cam 9 which has a roller 12 in the rotation section while pushing a roller 15 by rotation so that it may be combined with the actuation shaft 11 and a lever 14 may rotate, The spring 13 which carries out rotation energization of the spring receptacle member 19 connected with the actuation shaft 11, The hook 8 on which an end side runs against a roller 12 so that pars intermedia may be supported to revolve with the hook shaft 20 and may regulate rotation of a cam 9, The other end flank of hook 8 is equipped with the cross-section half moon-like locking pin 10 which stops free [sliding], and the solenoid 18 which drives lever section 10A of this locking pin 10 so that rotation of this hook 8 may be regulated.
[0003] Actuation of this actuation device section is explained. That is, the surrounding torque of the actuation shaft 11 generated with a spring 13 is held when the roller 12 formed in the cam 9 ****(ed) by the actuation shaft 11 is stopped by hook 8. The torque which this generates on hook 8 is held by the locking pin 10 with a half moon-like cross section. Lever section 10A is thrust up by the solenoid 18 at the time of actuation, the locking pin 10 rotates, hook 8 is released, and a cam 9 rotates clockwise centering on the actuation shaft 11. Under the present circumstances, a roller 15 is pushed by the side face of a cam 9, a lever 14 rotates counterclockwise centering on the auxiliary shaft 16, and the cutoff section 17 drives.
[0004] Thus, it has the structure of finally holding the mighty force of a spring 13 by the locking pin 10. However, since the force given to the locking pin 10 at the time of actuation was feeble, a possibility of the grease applied to the locking pin 10 as lubricant having fixed after prolonged neglect, and becoming actuation impossible had it.
[0005] On the other hand, there is semantics [maintenances, such as a grease supplement,] of laborsaving and it was possible to form a part for the said division into grease loess. TiN which has corrosion resistance and powerful wear-resistant ability in the front face of the locking pin 10 shown in drawing, and hook 8 in this formation of grease loess The layer was coated. It is TiN to drawing 5 . The cross section of a layer 5 is shown. 6 is the base material of locking pin 10 grade.
[0006]
[Problem(s) to be Solved by the Invention] However, this switchgear is TiN. There was un-arranging [that coefficient of friction of a layer was large and the operating physical force which rotates the locking pin 10 for this reason became large]. Therefore, the purpose of this invention is excelling in the corrosion resistance and abrasion resistance of a sliding part, and offering a switchgear with low coefficient of friction moreover.

[0007]
[Means for Solving the Problem] The switchgear of this invention is TiN to the front face of the sliding part of the member in which a pair carries out phase sliding. A layer is coated and it is this TiN further. It is characterized by having coated the amorphous transparence hard carbon layer on the surface of a layer.
[0008]
[Function] According to the configuration of this invention, it is TiN to the front face of a sliding part. A layer is coated and it is TiN further. Since the amorphous transparence hard carbon layer was coated on the surface of the layer, an amorphous transparence hard carbon layer is TiN. Since coefficient of friction is small as compared with a layer, coefficient of friction of a sliding part can be fallen further, and since a sliding friction becomes small for this reason, an operating physical force etc. can be reduced. Furthermore, it is TiN besides corrosion resistance. Abrasion resistance improves rather than layer independent coating.
[0009]
[Example] Drawing 1 thru/or drawing 3 explain one example of this invention. That is, this switchgear is TiN to the front face of the sliding part of the member 6 in which a pair carries out phase sliding as shown in drawing 1 . A layer 5 is coated and it is this TiN further. The front face of a layer 5 is coated with the amorphous transparence hard carbon layer 4.
[0010] In the example, as a member 6 of drawing 1 , as shown in drawing 2 , the locking pin 10 of the device sections of drawing 4 and hook 8 are applied, and it forms in the front face of the sliding part. Drawing 3 is TiN to the front face of carbon tool steel as a member 6. TiN by which only a layer 5 is equivalent to equivalent [(equivalent to the conventional example)], or this example It is as a result of the sliding trial of the example which carried out the laminating of the amorphous transparence hard carbon layer 4 to the layer 5, and is the related Fig. of coefficient of friction to the sliding distance of a sliding part. The inside of a graph, and Q1 TiN In the case of the conventional example of only a layer 5, it is Q2. TiN It is the case of this example that gave the amorphous transparence hard carbon layer 4 to the layer 5. clear from this drawing -- as -- the conventional example Q1 Example Q2 coefficient of friction -- high -- moreover -- the conventional example Q1 **** -- when the sliding distance of about 1km is exceeded, in this example, it turns out to coefficient of friction becoming high rapidly that coefficient of friction does not change even if it exceeds the sliding distance of about 3km. Therefore, TiN It is TiN like [coating / of a layer 5 / independent] this example. The direction of coating of the layer 5+ amorphous transparence hard carbon layer 4 has low coefficient of friction, and it turns out that abrasion resistance is excellent. Thereby, while being able to reduce an operating physical force, the engine performance in the grease loess of a sliding part can be improved.
[0011] In addition, said example is TiN. Although the part which coated the layer 5 and the amorphous transparence hard carbon layer 4 was a sliding part of the locking pin 10 and hook 8, it is applicable also like the sliding part of others of a switchgear.
[0012]
[Effect of the Invention] The switchgear of this invention is TiN to the front face of a sliding part. A layer is coated and it is TiN further. Since the amorphous transparence hard carbon layer was coated on the surface of the layer, an amorphous transparence hard carbon layer is TiN. Since coefficient of friction is small as compared with a layer, coefficient of friction of a sliding part can be fallen further, and since a sliding friction becomes small for this reason, an operating physical force etc. can be reduced. Furthermore, it is TiN besides corrosion resistance. It is effective in abrasion resistance improving rather than layer independent coating.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the expansion fragmentary sectional view of one example of this invention.
[Drawing 2] It is the partial perspective view of the sliding part of the control unit of a switchgear.
[Drawing 3] It is the related Fig. of coefficient of friction to the sliding distance of a sliding part.
[Drawing 4] It is the schematic diagram of the actuation device section of a switchgear.
[Drawing 5] It is the expansion fragmentary sectional view of the sliding section structure of the conventional example.
[Description of Notations]
4 Amorphous Transparence Hard Carbon Layer
5 TiN Layer
6 Member

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] To the front face of the sliding part of the member in which a pair carries out phase sliding, it is TiN. A layer is coated and it is this TiN further. Switchgear characterized by having coated the amorphous transparence hard carbon layer on the surface of a layer.

[Translation done.]

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L63: Entry 4 of 5 File: DWPI Sep 30, 1994

DERWENT-ACC-NO: 1994-352208
DERWENT-WEEK: 199444

TITLE: Switchgear for circuit breaker and disconnector - has titanium nitride and non-crystalline hard carbon layer coated on sliding surfaces of sliding members to reduce friction

PATENT-ASSIGNEE: NISSHIN ELECTRICAL CO LTD (NDEN)

PRIORITY-DATA: 1993JP-0061522 (March 22, 1993)

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 06275174 A	September 30, 1994		003	H01H033/42

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 06275174A	March 22, 1993	1993JP-0061522	

INT-CL (IPC): C04B 41/89; C23C 28/04; H01H 33/42

ABSTRACTED-PUB-NO: JP 06275174A
BASIC-ABSTRACT:

A titanium nitride layer and a non-crystalline transparent hard carbon layer are coated in turn on sliding surface of a pair of sliding members so as to reduce the friction of the sliding surfaces.

USE - The required operating force is reduced while improving corrosion resistance and durability.

ABSTRACTED-PUB-NO: JP 06275174A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.1/5

DERWENT-CLASS: L03 X13
CPI-CODES: L03-B04A;
EPI-CODES: X13-B05;

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Ｈ０１Ｈ　33/42	Ｑ			
Ｃ０４Ｂ　41/89	Ｊ			
Ｃ２３Ｃ　28/04				

審査請求　未請求　請求項の数１　ＯＬ　（全　３　頁）

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(22)出願日　平成５年(1993)３月22日

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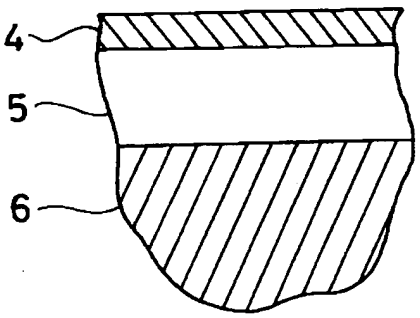
(54)【発明の名称】　開閉装置

(57)【要約】
【目的】摺動部分の耐食性および耐摩耗性に優れ、しかも摩擦係数が低い開閉装置を提供する。
【構成】一対の相摺動する部材６の摺動部分の表面に、TiN 層５をコーティングし、さらにこのTiN 層５の表面に非晶質透明硬質カーボン層４をコーティングしている。



4…非晶質透明硬質カーボン層
5…TiN 層
6…部材

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【特許請求の範囲】

【請求項１】　一対の相摺動する部材の摺動部分の表面に、TiN 層をコーティングし、さらにこのTiN 層の表面に非晶質透明硬質カーボン層をコーティングしていることを特徴とする開閉装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、遮断器または断路器等の開閉装置に関するものである。

【０００２】

【従来の技術】開閉装置の操作機構部を図４に示す。すなわち、この開閉装置の操作機構部は、遮断部１７と、中間部が補助軸１６に軸支されて一端部を遮断部１７に連結し、他端部にローラ１５を設けたレバー１４と、操作軸１１に結合されてレバー１４が回動するように回動によりローラ１５を押動するとともに回動部にローラ１２を有するカム９と、操作軸１１に連結されたばね受け部材１９を回動付勢するばね１３と、中間部がフック軸２０により軸支されてカム９の回動を規制するようにローラ１２に一端面が突き当たるフック８と、このフック８の回動を規制するようにフック８の他端側部に摺動自在に係止する断面半月状の鎖錠ピン１０と、この鎖錠ピン１０のレバー部１０Ａを駆動するソレノイド１８とを備えている。

【０００３】この操作機構部の動作について説明する。すなわち、ばね１３により発生する操作軸１１のまわりのトルクは操作軸１１に剛結されたカム９に設けられたローラ１２がフック８に止められることにより保持される。これによりフック８に発生するトルクは半月状の断面をもつ鎖錠ピン１０により保持される。操作時にはソレノイド１８によりレバー部１０Ａが突き上げられ、鎖錠ピン１０が回動し、フック８が解放され、カム９が操作軸１１を中心に時計方向に回転する。この際カム９の側面によりローラ１５が押されレバー１４が補助軸１６を中心に反時計方向に回転し、遮断部１７が駆動される。

【０００４】このように、ばね１３の強大な力を最終的には鎖錠ピン１０により保持する構造となっている。ところが、操作時に鎖錠ピン１０に与えられる力は微弱なものであるので、長期間放置後には鎖錠ピン１０に潤滑材として塗布されたグリスが固着して操作不能になるおそれがあった。

【０００５】一方、グリス補充等のメンテナンスの省力化の意味もあり、同部分をグリスレス化することが考えられた。このグリスレス化にあたり、図に示す鎖錠ピン１０とフック８の表面に耐食性および強力な耐摩耗性能をもつTiN 層をコーティングした。図５にTiN 層５の断面を示す。６は鎖錠ピン１０等の母材である。

【０００６】

【発明が解決しようとする課題】しかし、この開閉装置

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は、TiN 層の摩擦係数が大きく、このため鎖錠ピン１０を回転させる操作力が大きくなるという不都合があった。したがって、この発明の目的は、摺動部分の耐食性および耐摩耗性に優れ、しかも摩擦係数が低い開閉装置を提供することである。

【０００７】

【課題を解決するための手段】この発明の開閉装置は、一対の相摺動する部材の摺動部分の表面に、TiN 層をコーティングし、さらにこのTiN 層の表面に非晶質透明硬質カーボン層をコーティングしていることを特徴とするものである。

【０００８】

【作用】この発明の構成によれば、摺動部分の表面にTiN 層をコーティングし、さらにTiN 層の表面に非晶質透明硬質カーボン層をコーティングしたため、非晶質透明硬質カーボン層はTiN 層に比較して摩擦係数が小さいので、摺動部分の摩擦係数をより一層低下することができ、このため摺動抵抗が小さくなるので操作力等を低減することができる。さらに耐食性のほかTiN 層単独のコーティングよりも耐摩耗性が向上する。

【０００９】

【実施例】この発明の一実施例を図１ないし図３により説明する。すなわち、この開閉装置は、図１に示すように一対の相摺動する部材６の摺動部分の表面に、TiN 層５をコーティングし、さらにこのTiN 層５の表面に非晶質透明硬質カーボン層４をコーティングしている。

【００１０】実施例では、図１の部材６として、図２に示すように図４の機構部のうちの鎖錠ピン１０とフック８を適用し、その摺動部分の表面に形成している。図３は部材６として炭素工具鋼の表面にTiN 層５のみ（従来例に相当）、またはこの実施例に相当するTiN 層５に非晶質透明硬質カーボン層４を積層した例の摺動試験の結果であり、摺動部分の摺動距離に対する摩擦係数の関係図である。グラフ中、Q_1 はTiN 層５のみの従来例の場合、Q_2 はTiN 層５に非晶質透明硬質カーボン層４を施したこの実施例の場合である。この図から明らかなように、従来例Q_1 は実施例Q_2 よりも摩擦係数が高く、しかも従来例Q_1 では約１ｋｍ程度の摺動距離を越えると摩擦係数が急激に高くなるのに対して、この実施例では約３ｋｍ程度の摺動距離を越えても摩擦係数が変化しないことがわかる。したがって、TiN 層５の単独のコーティングよりもこの実施例のようにTiN 層５＋非晶質透明硬質カーボン層４のコーティングの方が、摩擦係数が低く、耐摩耗性が優れていることがわかる。これにより、操作力が低減できるとともに摺動部分のグリスレスでの性能を向上することができる。

【００１１】なお、前記実施例は、TiN 層５と非晶質透明硬質カーボン層４とをコーティングした部分が、鎖錠ピン１０とフック８との摺動部分であったが、開閉装置のその他の摺動部分にも同様に適用することができる。

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【0012】

【発明の効果】この発明の開閉装置は、摺動部分の表面にTiN 層をコーティングし、さらにTiN 層の表面に非晶質透明硬質カーボン層をコーティングしたため、非晶質透明硬質カーボン層はTiN 層に比較して摩擦係数が小さいので、摺動部分の摩擦係数をより一層低下することができ、このため摺動抵抗が小さくなるので操作力等を低減することができる。さらに耐食性のほかTiN 層単独のコーティングよりも耐摩耗性が向上するという効果がある。

【図面の簡単な説明】

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【図1】この発明の一実施例の拡大部分断面図である。

【図2】開閉装置の操作部の摺動部分の部分斜視図である。

【図3】摺動部分の摺動距離に対する摩擦係数の関係図である。

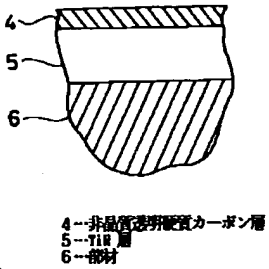
【図4】開閉装置の操作機構部の概略図である。

【図5】従来例の摺動部構造の拡大部分断面図である。

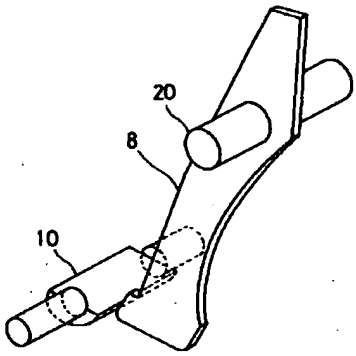
【符号の説明】

4　非晶質透明硬質カーボン層
5　TiN 層
6　部材

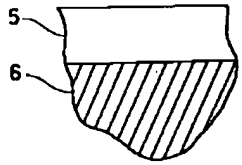
【図1】



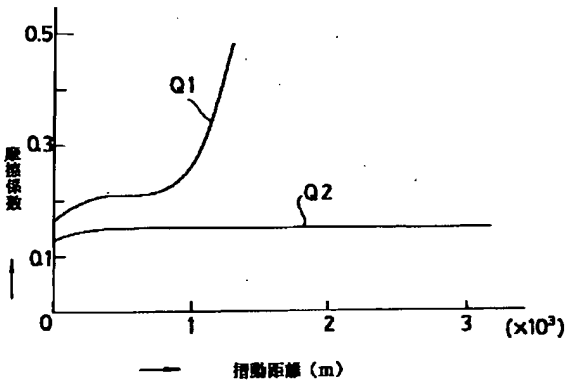
【図2】



【図5】



【図3】



【図4】